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TANGANYIKA TERRITORY
DEPARTMENT OF AGRICULTURE

Eleventh Annual Report of the Coffee Research and Experiment Station, Lyamungu, Moshi 1944

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COFFEE RESEARCH AND EXPERIMENT STATION, LYAMUNGU, MOSHI

Report for the period 1st January to 31st December 1944

ADMINISTRATION—STAFF LIST, 1944

Chief Scientific Officer: S. M. Gilbert, B.Sc. (Agric.), N.D.A., Dip. Agric. (Wye).

Agricultural Officer: J. K. Robertson, B.Sc. (Agric.), (Aberd.), A.I.C.T.A.

The Plant Pathologist (Dr. Wallace) and the Temporary Scientific Assistant (Mrs. Wallace) are also accommodated at the station but are engaged in general departmental duties.

STAFF CHANGES

The Plant Pathologist was in charge of the station from 1st January to 5th May when the Chief Scientific Officer assumed duty on return from special leave. Mr. Robertson reported for duty as Agricultural Officer on 13th January.

CONTACTS WITH GROWERS

Under war-time conditions planters found difficulty in visiting the station. At various dates in July, however, large parties of Africans, Chiefs, Instructors, members of the Kilimanjaro Native Co-operative Union and school children came to see the work on hand.

FINANCE

Details of expenditure for the year are given in Appendix I. Revenue amounted to £1,815 of which £1,524 14*s*. was from coffee.

STATION DEVELOPMENT

In 1944 two additional Latin squares were planted for comparative trials of clonal selections. Further areas of bananas and fodder grasses were also established.

The following table shows how the land is at present occupied:—

		Acres	Change
Coffee:			
(a) under 3 years	15·71		
(b) 3 to 6 years	29·58	83·10	+ 0·60
(c) over 6 years	37·81		
Nurseries		2·00	
Bananas and fodder grasses		45·50	+ 2·00
Paddocks		30·00	
Coppices and wind belts		33·00	
In preparation for experiments		11·40	— 0·60
Forest		30·00	
Roads, buildings, etc.		27·00	
Bush—cleared and uncleared		40·50	— 2·00
Food crops		7·50	
Total		310·00	

METEOROLOGY

The year's rainfall, which was very well distributed, amounted to 72·64 inches.

VEGETATIVE PROPAGATION

The number of cuttings rooted was more than 6,000. In the absence of peat moss litter a somewhat similar substance occurring locally was tried but it was not successful. Thus coconut fibre continues to be used with sand as the rooting medium. This work is suffering from a lack of skilled supervision and the mortality after "potting up" is very high.

PESTS AND DISEASES

Sodium arsenite bait proved quite inadequate to control Antestia under these conditions. Moreover much damage was done to the trees by scorching. In the absence therefore of first-grade pyrethrum powder for dusting a large part of the crop was damaged; out-turns in some areas only yielding seven per cent clean coffee to cherry.

Hemileia was very prevalent. This was probably due to the weakness of the trees in general caused, firstly, by the long drought in 1943 and, secondly, because the crop in that year was not reduced to prevent over-bearing.

PUBLICATIONS

Articles by the Chief Scientific Officer on "The Costs of Rooting Cuttings of *Coffea arabica*" and "The History of the Station Herd" were published by the *East African Agricultural Journal* and *Tropical Agriculture* and a pamphlet on "The Improvement of Quality" by the department.

ANIMAL HUSBANDRY

The general health of the herd was good but mortality in young calves was high. Sixteen calves were born during the year of which eight were heifers. Of the sixteen milking cows four gave more than 3,000 pounds of milk in lactations of 300 days whilst a further four gave more than 2,000 pounds.

At the end of the year the stock consisted of:—

Kind	Number
Stud bulls	2
Bulls for sale	9
Cows	17
Heifers and heifer calves	21
Bull calves	13
Total	62

Heifers sired by the stud bull C.R.S. I. are near the age for service. Accordingly a second herd was formed. The new sire for this herd is a Sahiwal-Boran cross bred bull obtained through the good offices of the Kenya Veterinary Department.

RESULTS OF EXPERIMENTS

Work was again confined to the station. Experiments I, VIIa and IX yielded no appreciable crops owing to the drought and over-bearing in 1943. Experiment XIV was in process of conversion to Multiple Stem and in consequence also yielded poorly. Suckers were allowed to grow in readiness for the second cycle

in Experiments XIIIa, XIIIb and XIIIc and this again reduced yield. Together with guard rows the total area now under the "Multiple Stem" system of growth is about twenty-five acres.

Owing to the rainfall distribution, which was ideal for the growth of coffee from July to December, the crop could not be dried naturally. It was dried artificially in Moshi and as a consequence faded badly and its quality was lowered. Antestia further greatly reduced the quantity and quality of the crop. To summarize where ameliorative treatments were not applied 1944 was excellent for growth and for prospects of good yields in 1945 but bad for the 1944 crop.

The following are the results of the various experiments for 1944 together with a summary for the period of years during which they have been in existence.

EXPERIMENT I.—*Method of planting—Planted 1935*

There was no recordable yield in 1944 owing to over-bearing during the drought year of 1943.

(a) MAIN PLOTS

Summary of results.—Mean of 7 years—1938 to 1944

	Clean cwt. per acre	Percentage
No holing	7·29	106·7
*H3F1	7·71	112·9
†HF1	6·01	88·0
Hole sub-soiled:		
Without compost H3F1	7·12	104·2
„ „ HF1	6·36	93·1
With compost H3F1	7·09	103·8
„ „ HF1	6·29	92·1
Mean	6·83	100·0
Standard error	0·22	3·2
Significant difference, P = ·05	0·64	9·4

*H3F1 = Holed three months and filled one month before planting.
†HF1 = Holed and refilled one month before planting.

(b) SUB-PLOTS

Summary of results for 7 years—1938 to 1944

Planting:	Clean cwt. per acre	Percentage
Deep with ball of earth	6·37	93·3
Deep with bare roots	6·22	91·1
At nursery level:		
With ball of earth	7·44	109·0
Bare roots	7·31	107·0
Mean	6·83	100·0
Standard error	0·12	1·8
Significant difference, P = ·05	0·33	4·8

This experiment has set a heavy crop for 1945.

EXPERIMENT II.—*Seedling Selection Trials—Planted 1938*

The summaries for three Latin squares are given below. It is still too early to comment usefully on the respective performances as some of the higher yielders suffered severely from die-back in 1944 and will therefore yield correspondingly less in 1945.

Summary of results.—Latin Square I—Planted 1938

Tree Number	Mean yield, 1944		Mean of 4 years, 1941-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
P147	5·97	88·2	3·03	77·7
P190	3·69	54·5	1·83	46·9
P280	7·87	116·2	5·11	131·0
P313	8·30	122·6	5·00	128·2
P348	6·38	94·2	3·63	93·1
F502	8·42	124·4	4·80	123·1
Mean	6·77	100·0	3·90	100·0
Standard error	0·42	6·2	0·18	4·6
Significant difference, P = ·05	1·24	18·3	0·54	13·8

Latin Square II—Planted 1939

Tree Number	Mean yield, 1944		Mean of 3 years, 1942-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
E59	3·94	91·8	2·25	74·8
N39	3·35	78·1	2·46	81·7
P147	4·28	99·8	2·60	86·4
H133	4·37	101·9	3·54	117·6
F839	5·39	125·6	3·76	124·9
L1	4·42	103·0	3·48	115·6
Mean	4·29	100·0	3·01	100·0
Standard error	·24	5·6	0·18	6·0
Significant difference, P = ·05	·70	16·3	0·52	17·3

Latin Square III—Planted 1939

Tree Number	Mean yield, 1944		Mean of 3 years, 1942-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
E665	4·24	70·8	2·69	67·9
P313	5·87	98·0	4·43	111·9
N50	4·55	76·0	3·63	91·7
H1	8·36	139·6	4·85	122·5
N69	5·06	84·6	3·77	95·2
F840	7·87	131·4	4·44	112·1
Mean	5·99	100·0	3·96	100·0
Standard error	0·44	7·3	0·28	7·1
Significant difference, P = ·05	1·30	21·7	0·82	20·7

EXPERIMENT III.—*Clonal* versus *Seedling Trees—Planted 1937*

This area serves rather as a practice plot for grafting rather than as an experiment.

EXPERIMENT IV.—*Seedling Stocks—Planted 1936*

Staff conditions do not permit of grafting being done on these stocks which are on multiple stem in readiness.

EXPERIMENT V.—*Mulch, Compost and Nitrogen—Planted 1940*

This three by three by three factorial experiment with clonal material comparing Elephant grass mulch, compost and sulphate of ammonia has so far only shown mulch as an advantageous treatment. A summary of three years is given below in regard to mulch.

Summary of results for "Mulch Effects" for 1944

	M0	M1	M2	Mean	Standard error	Significant difference (P = ·05)
Clean cwt. per acre	1·82	2·53	2·56	2·30	0·23	0·64
Percentage	79·1	110·0	111·3	100·0	10·0	27·8
Mean of 3 years, 1942 to 1944						
Clean cwt. per acre	1·39	1·85	1·80	1·68	0·09	0·26
Percentage	82·8	110·1	107·3	100·0	3·5	15·6

The two amounts of mulch, M_1 and M_2, were 40 pounds and 80 pounds respectively, the half-dose being in a strip covering the lines of trees only, whilst the full dose covered the whole area of the plots. Since the root range of the young trees was probably limited to the half-strips no difference in the results from the amounts applied was to be expected at this stage.

EXPERIMENT VI.—*Manurial Experiment*

It has not been possible to obtain the fertilizers required for treatments and the area is being recorded by plots to be used as a "uniformity trial" until they are available.

EXPERIMENT VIIa.—*Conversion to Multiple Stem—Converted 1940*

This area was cut up heavily to encourage the growth of suckers for the second cycle. The yields for 1944 are therefore low and are not published.

The mean yields for the five years of the first cycle are given below:

	Means of 5 years, 1940-44	
	Clean cwt. per acre	Percentage
Clean stumped, 3 suckers	6·62	86·7
West side primaries cut off, 3 suckers from bottom	8·32	108·9
East side primaries cut off, 3 suckers from bottom	8·32	108·9
All except top three pairs of primaries cut off, 3 suckers from bottom	8·49	111·1
Agobiada, multiple stem, 3 suckers	7·13	93·3
Top cut at 3 feet from ground and 3 suckers left to grow at top	7·30	95·6
Mean	7·64	100·0
Standard error	0·27	3·7
Significant difference, P = ·05	0·75	9·8

The methods of conversion previously advocated, namely either to cut off one half of the tree or to leave a canopy of three pairs of primaries at the top are confirmed and recommended.

EXPERIMENT IX.—*Methods of Cultivation—Planted 1934*

Over a period of seven years there have been no significant differences in yield due to the various treatments. Trenching which did so much damage by cutting the roots in 1938 has caught up, thus confirming the view that roots do regenerate given good conditions.

Summary of results.—Mean of 7 years—1938 to 1944

Treatment:	Clean cwt. per acre	Percentage
Forked hoe (forked jembe)	3·95	109·4
West Indian hoe (jembe)	3·91	108·3
No cultivation	3·78	104·7
Envelope forked	2·97	82·3
Trenching	3·41	94·5
Mean	3·61	100·0
Standard error	0·28	7·8

These results do not pass the "Z" test.

EXPERIMENT X.—*Artificial Shade—Planted 1937*

This experiment still remains in abeyance owing to the impossibility of obtaining webbing.

EXPERIMENT XI.—*Kents* versus *Bourbon—Planted 1935*

The mean yields to date of Kents and Bourbon types of coffee are given below. There was severe die-back in both.

Summary of results—1938 to 1944

	Clean cwt. per acre				Clean cwt. per acre	
	Kents	Bourbon			Kents	Bourbon
1938	7·69	7·12	1942		5·72	9·34
1939	4·86	3·11	1943		11·84	8·01
1940	3·70	5·10	1944		12·90	9·20
1941	12·87	9·51	Mean		8·51	7·34

EXPERIMENT XII.—*Selection in Nursery—Planted 1935*

The selections of good seedlings at the time of planting is confirmed by the summary of seven years' yields.

Summary of results

	Mean yield, 1944		Mean of 7 years, 1938-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Tops cut back	5·19	107·0	4·09	93·8
Good tops and good roots	4·43	92·4	5·19	119·0
Average	4·50	92 8	4·34	99·5
Good tops and poor roots	5·02	103·5	4·55	104·3
Poor tops and good roots	4·71	97·1	4·10	94·0
Poor tops and poor roots	5·22	107·6	3·92	89·9
Mean	4·85	100·0	4·36	100·0
Standard error	0·44	9·1	0·18	4·1

The results do not pass the test for significance.

EXPERIMENTS XIIIa, XIIIb AND XIIIc.—*Multiple Stem* versus *Single Stem*

This experiment is ending its first cycle and in 1945 will be partly on the old system and partly on the new suckers of the second cycle. The yields in 1944 were again good but with single stem plots giving yields nearer to those of multiple stem (3 stems). This was because the multiple stem trees were cut up to encourage sucker growth.

Summary of results

	Mean yield, 1944		Mean of 6 years, 1939-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Single stem	7·54	99·9	5·30	70·0
Multiple stem, 3 suckers ...	8·05	106·6	10·13	133·9
Agobiada, multiple stem, 3 suckers	7·07	93·6	7·28	96·2
Mean...	7·55	100·0	7·57	100·0
Standard error	0·18	2·4	0·51	6·7
Significant difference, P = ·05	0·63	8·3	1·78	23·5

EXPERIMENT XIV.—*Mulch Experiment—Planted 1935*

This experiment was cut up to bring the trees on to multiple stem—half of each tree being removed. A small crop was obtained. It is noted that for the first time clean weeded plots gave the best yields. A probable reason is that

the rainfall distribution was so good that the mulch was unnecessary, but rather used up moisture and nitrogen to break itself down. If this is the true explanation it will be reflected in the future yields. Over a period of seven years, however, there is no question as to the general superiority of the mulched plots. Compost on the contrary gives no appreciable response.

Summary of results

Treatment (per tree)	Mean yield, 1944		Mean of 7 years, 1938-44	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Banana mulch (80 lb.)	1·60	88·4	6·88	123·1
Guinea grass mulch (80 lb.)	2·11	116·6	6·62	118·4
Banana mulch (40 lb.) plus sulphate of ammonia (½ lb.)	0·35	19·3	5·47	97·8
Elephant grass mulch (80 lb.)	0·79	43·6	4·72	84·4
Clean weeded	3·20	176·8	5·43	97·1
Weeds as mulch	1·26	69·6	4·54	81·2
Elephant grass mulch (40 lb.) plus sulphate of ammonia (½ lb.)	1·91	105·5	5·23	93·6
Clean weeded plus compost (2 debes)	3·24	179·0	5·83	104·3
Mean	1·81	100·0	5·59	100·0
Standard error	0·43	23·0	0·29	5·2
Significant difference, P = ·05	1·25	69·6	0·83	14·8

EXPERIMENT XIVa.—*Mulch Experiment—Planted 1940*

In this clonal experiment the results confirm those of Experiment XIV in regard to mulches. In the sub-plots nitrogen continues to have a depressing effect, but less so in 1944 than formerly. In the field benefits of nitrogen are becoming apparent both in the appearance and in the growth of the trees. In the meantime under these conditions nitrogen should not be applied to trees that have not reached full bearing and which are not in full leaf.

Summary of results.—Mean of 3 years—1942 to 1944

Treatment:	Main plots		Without Nitrogen*		With Nitrogen* 4 oz. per tree	
	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage	Clean cwt. per acre	Percentage
Nil	2·27	98·7	2·31	82·5	2·24	99·1
Banana mulch (80 lb. per tree)	2·72	107·5	3·02	107·9	2·43	107·5
Elephant grass (80 lb. per tree)	2·44	96·4	2·55	91·1	2·33	103·1
Guinea grass (80 lb. per tree)	3·06	120·9	3·70	132·1	2·43	107·5
Compost (50 lb. per tree)	2·13	83·2	2·41	86·1	1·85	81·9
Mean	2·53	100·0	2·80	100·0	2·26	100·0
Standard error	–	–	0·14	5·0	0·14	6·2
Significant difference P = ·05	–	–	0·42	15·0	0·42	18·6

*Sulphate of ammonia.

EXPERIMENT XV.—*Irrigation and Mulching—Planted 1940*

This experiment requires a thorough examination in regard to the relationships between seasonal conditions, treatments and results, but the present staff is inadequate to do this at present. The simple results, such as the direct effects of irrigation or mulch, are, however, sufficiently noteworthy to publish the data.

Treatments *Water	†Mulch	Mean yield for 1944 Clean cwt. per acre	Mean of 3 years 1942-44 Clean cwt. per acre
Nil	Nil	0·28	1·30
Nil	40 lb. once a year	3·09	4·17
Nil	80 lb. „	6·08	5·65
Nil	40 lb. twice a year	6·51	5·01
Monthly:			
2 inches	Nil	5·28	4·21
„	40 lb. once a year	8·23	7·27
„	80 lb. „	6·66	7·06
„	40 lb. twice a year	8·30	7·31
Monthly:			
4 inches	Nil	6·30	5·13
„	40 lb. once a year	9·03	8·24
„	80 lb. „	6·98	6·88
„	40 lb. twice a year	10·76	7·44
Fortnightly:			
2 inches	Nil	7·63	5·52
„	40 lb. once a year	7·83	6·57
„	80 lb. „	11·49	7·81
„	40 lb. twice a year	7·63	5·75
Mean		7·0	5·96

*Rainfall is made up to the quantity mentioned by means of irrigation. No irrigation is given if the rainfall exceeded the treatment.

†Banana trash—if one application it is applied after the long rains, if two after the short rains as well.

Lyamungu,
May 1945

S. M. GILBERT,
Chief Scientific Officer

STATEMENT OF EXPENDITURE FOR THE PERIOD 1ST JANUARY TO 31ST DECEMBER 1944

I.—Personal Emoluments

Item No.		Provision Shs.	Cts.		Expenditure Shs.	Cts.
3.	Chief Scientific Officer	24,000	00	...	24,000	00
21.	Clerks (L.C.S.)	5,140	00	...	5,140	00
23.	Recorders (L.C.S.)	5,933	00	...	5,636	77
24.	Mechanics (L.C.S.)	4,740	00	...	4,710	00
25.	Instructors (L.C.S.)	780	00	...	750	00
27.	African Laboratory Assistants	1,416	00	...	—	
28.	Overseers	870	00	...	864	00
29.	Motor Drivers	600	00	...	600	00
30.	Messenger	540	00	...	386	33
		44,019	00	...	42,087	10

II.—Other Charges

32.	Travelling Allowances	1,000	00	...	572	00
33.	Transport	4,300	00	...	3,682	04
34.	Maintenance and Running of Motor Vehicles	3,600	00	...	2,355	57
35.	Bicycles	50	00	...	29	29
36.	Books of Reference	500	00	...	164	75
37.	Contingencies	150	00	...	148	75
39.	Stationery	300	00	...	91	58
42.	Uniforms	100	00	...	75	68
53.	Upkeep of Agricultural Stations	2,400	00	...	2,189	11
55.	Upkeep of Coffee Research Station:					
	(a) Labour			...	33,999	93
	(b) Field Experiments off Station			...	—	
	(c) Maintenance of Power, etc.			...	2,977	21
	(d) Maintenance of Water Supply			...	499	76
	(e) Upkeep of Coffee Factory	48,000	00	...	1,799	67
	(f) Upkeep of Stock			...	2,310	02
	(g) Equipment and Materials			...	3,294	44
	(h) Trials of Clonal Coffee			...	2,499	55
	(i) Miscellaneous			...	600	00
		60,400	00	...	57,289	35
47.	Increased Food Production:					
	(b) Production of Vegetable Seed	4,300	00	...	3,010	08

Head 27, Miscellaneous Services

4.	Cost of Living Relief				4,866	92
28.	Transport and Allowance on Leave				190	10
29.	Postage				11	70
					5,068	72

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